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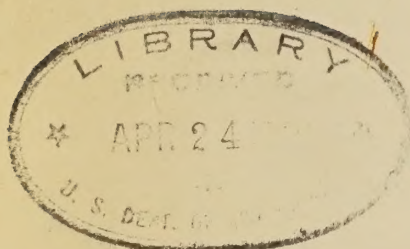
Reserve

MINUTES

of

TWENTY-FIRST VALLEY-STATES CONFERENCE

Hotel Andrew Johnson, Knoxville, Tennessee
April 3, 1944



August 1944

M I N U T E S
of
TWENTY-FIRST VALLEY-STATES CONFERENCE
Hotel Andrew Johnson, Knoxville, Tennessee
April 3, 1944

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Dean Thomas P. Cooper, Chairman of the Conference, called the meeting to order at 9:00 a.m.

/For the Roll of the Conference see Appendix A; and for the Program of the Conference see Appendix B./

The Chairman announced to the Conference that Dr. Harcourt A. Morgan, member of the Board of Directors of the Tennessee Valley Authority, would address the luncheon session of the Conference on a topic of special interest. The Chairman also announced that Dr. Roger B. Corbett, Secretary of the American Farm Bureau Federation, was in attendance and would participate in the discussions.

I. Agricultural-industrial relationships, problems, and outlook

The Chairman introduced Dean I. O. Schaub to lead the discussion on this topic.

/A summary of Dean Schaub's remarks will be found in Appendix C./

DISCUSSION

The following points were brought out in the discussion following Dean Schaub's introductory statement:

1. Importance and character of the problem
 - A. Low prices of what the farmer sells relative to high prices of what the farmer buys (due primarily to high urban wages) is a central factor in the problem. The farmer sells at wholesale and buys at retail.
 - B. Farmers on small farms (who comprise a large segment of the agricultural economy of the Valley) need a supplementary source of income.
 - C. Although in certain localities members of a large proportion of the farm families work in industrial plants in neighboring towns, these plants, for the most part, are not engaged in the processing of farm products, and, hence, there is no genuine integration between production on the farm and industrial employment.
 - D. Relatively few farm communities conceive of an "ownership interest" extending to industrial employment in connection with processing farm products. They do not think of this aspect of agriculture in terms of ownership. Social and mental inertia are obstacles to be overcome.
 - E. In the absence of proper organization, the small farmer is not in position to provide, much less to guarantee, a constant source of supply.

- F. Not only volume but standardization of products is highly important. A considerable degree of specialization on commodities is often an important factor. Local facilities for grading and for cold storage are important factors.
- G. Although industrial expansion is taking place at a rapid rate, such expansion may tend to retard the industrial integration of agriculture by the diversion of cheap power to urban industries.

2. Ways and means

- A. Processing of their products in plants owned and controlled by farmers is essential to obtain the expansion needed by small farm business units to provide an adequate income and living for farm families.
- B. The availability of low-cost electric power introduces new possibilities for rural-industrial integration. It is, therefore, of the highest importance that measures be taken to see that this power becomes available to farmers.
- C. Specific determinations must be made for each community as to its resources in terms of products produced, labor available, capital requirements and resources, as a basis for evaluating industrial possibilities.
- D. A standardized product in adequate volume must be assured.
- E. Leadership must be encouraged and programs for the development of engineering skills and training in techniques of management must be provided.
- F. Local cooperative organizations of suitable types are essential and the possibilities of large cooperatives such as the G. L. F. in New York, the Eastern States in New England and the South-eastern States Cooperative should be considered particularly in relation to carrying the capital burden involved.

Chairman Cooper summarized the discussion as follows:

Schaub, you started this. This has been an extremely interesting discussion. But what can this group do? Can we do something about it or is it just talk?

Let me summarize it and inject another factor that will prolong the discussion.

Summarizing your discussion, you recognize that something has to be done. Some are thinking in terms of developing local co-operatives that would carry the processing on further at least

than we have at the present time. That leads into difficulties from a financial standpoint and also from the standpoint of employing trained personnel that would carry on this processing. Others have advanced the thought of bringing in industries of another type that would take care of employment for some time for farm people.

I cannot answer your question as to what we can do about it other than to suggest that we do get some definite studies crystallized and follow through. Where shall we get them crystallized.

I want to inject this further thought into it. I think from the discussions I have heard this morning we are going on the assumption that we want to keep all of our people on the land and inject something that will raise the standard of living. This is the question. Do we want to keep people on the land we now have? In 12 cotton states you have over 50 percent of the agricultural population in the United States and are getting about 35 percent of the income. Personally, I don't believe we can bring up the standard of living we all talk about until we know what we have in mind. I don't believe we are going to do it on the small uneconomic farms that we have prevailing in the South. I think we have to increase that economic unit, and that means displacing a large part of the farm population we have now. Personally I don't believe there is any possibility of maintaining the standard of living we want when we have 20 acres of crop land for farm families in the entire South, and it runs smaller than that in the Valley area. Do we want to go on the basis of keeping farm population here or moving them into another area? I wonder if we ought to have some kind of committee that can be studying this. This is a bone we all like to gnaw on. We ought to have a committee of about three.

(NOTE: The Committee on Resource Utilization, later established by the Conference, will be concerned with questions of the type referred to by Chairman Cooper.)

II. Farm programs, problems, and outlook

A. Fertilizer enough

/Dean Thomas Cooper led the discussion on the first part of the general topic, relating to fertilizer. The data presented by Dean Cooper will be found in Appendix D.7

DISCUSSION

Cooper: These figures, it seems to me, have a reasonable amount of validity, so far as agriculture as a whole is concerned. But when it comes to the question of our real agricultural needs, these figures fall far short of revealing the true situation. Broadly, these

are two aspects of the situation: first, there has been a fine job of study through experiment station and extension groups which has resulted in farmers taking over, developing in rotations, and building up our agricultural lands; second, we are far short of the goal we must reach, if we are to meet the real needs of agriculture. I want to leave that there.

Brehm: There is an adequate amount of these fertilizers. Here are the bottlenecks: (1) labor and transportation facilities to get it out; (2) what the Government is going to do in taking men under 26; (3) fertilizer orders and shipments are way ahead of what they were a year ago, but large amounts of the fertilizer may not be used, depending on whether the boys under 26 are going into the Army or not; and, incidentally, the manpower in getting the crops harvested.

Cooper: I have, like all the rest of you, been interested in the development of our phosphate resources. About a month ago, I had an opportunity to get in touch with representatives of the American Farm Bureau Federation who are working on this particular problem and trying to develop future plans. I was rather enthusiastic regarding developments that seemed to be in front of us--affecting this region, yes, but affecting many other regions to a greater extent. I took the liberty of asking Dr. Roger B. Corbett, Secretary of the American Farm Bureau Federation, who was originally Director of the Maryland Agricultural Experiment Station, to attend the Conference and tell us what is going on. I was particularly impressed with the thinking of the group of which Mr. Kirkpatrick and Dr. Corbett were leaders and of the developments taking place. Dr. Corbett, won't you come up and tell us something of your plans?

[A summary of Dr. Corbett's remarks will be found in Appendix E.]

DISCUSSION

At the conclusion of Dr. Corbett's remarks, a question was raised as to whether the program outlined by him was confined to phosphate:

Corbett: It goes further: potassium metaphosphate, calcium metaphosphate, etc. All that is in the picture.

Baver: What about the present commercial superphosphate plants we now have scattered over the country?

Corbett: They would keep on working. We are not talking about taking over all supplies. We are talking about 5 percent. The proposal is that in this western plant 25 percent of its output go into research and demonstration, and that 75 percent be handled through commercial channels.

McAmis: Does that contemplate reserves in the hands of farmers?

Corbett: Dr. Peterson pointed out that the state of Utah has just recently gotten control of 90 million tons of P_2O_5 . The Department of Interior controls most of it, and there is tremendous pressure to release it into private hands. I think the answer to Mac's question is that certain areas would be controlled by farm groups.

The Chairman then introduced Director C. A. Mooers to lead the discussion on the second phase of the problem of fertilizer supply: Tennessee phosphate deposits in relation to the Valley program.

[A summary of Director Mooers' remarks will be found in Appendix F.]

DISCUSSION

Davis: A thorough survey has been made of all these deposits. There are certain low-grade deposits in Limestone County, Alabama. A complete survey has been made insofar as feasible. Low grades do not figure much in this survey. They don't amount to enough to take into consideration. A large part of the deposits in Tennessee can't be mined satisfactorily. To be mined satisfactorily they have to have large deposits in one place. In these estimates for Tennessee our deposits are supposed to be about one-tenth of those in Florida but include 20 to 40 percent B.P.L. and require washing to bring it up to 72 percent B.P.L. material.

Cooper: Director Mooers, if we are looking ahead intelligently to our interests, we need to encourage other developments on a large scale in order that we may have our material to use in this area.

Davis: Certainly we are going to deplete this. Dr. Corbett has presented us something. What is the next step?

Corbett: There are two steps that we are trying to take, "P.O." We have asked an informal group from the Land-Grant Colleges to sit with us and review this program and advise us on it. We have asked this group to come to Chicago on the 13th. The purpose is to get a program in which the Farm Bureau and the Land-Grant Colleges are in complete accord. If a man wants to criticize the plan, we want him to have an opportunity to do so.

Hutcheson: What is the relationship with other farm organizations?

Corbett: That is the second step. We feel that we should tie in with other farm organizations particularly the cooperatives and the Grange.

Hutcheson: I think it is pretty essential to tie up with the Grange and Bureau and, if possible, with the Farmers' Union, because when we step out here with the Farm Bureau and Land-Grant Colleges, and another agency steps out with the Grange on a different kind of program, and someone with the National Cooperative on another kind of program, confusion will result. If we can get them together, and I believe sufficient time should be spent to get them together, and the Cooperative Council and Grange all endorse the same program, you will get along better.

Cooper: Does this group wish to give any indication of their reaction to the tentative program that Dr. Corbett has presented?

Davis: I am going to move, if it is all right to make a motion, that we concur in the views expressed by Dr. Corbett and endorse the general objective presented and go through regular machinery.

Brehm: Motion seconded.

Hutcheson: Isn't it pretty essential we have in this picture the Extension viewpoint and Experiment Station viewpoint. I think the biggest part of the job is extension. You are talking about Land-Grant College relationships. I would like to visualize all these programs starting with farmers, through extension, and have a voice for agriculture on this thing.

Corbett: Our definite plan is to work with the National Office of Extension and the National Office of Experiment Stations.

Cooper: You have heard the motion made by Mr. Davis and seconded by Mr. Brehm.

Hutcheson: Of course, after going into it in detail, if we find flies in it we can get rid of them. Generally, we are in favor of it.

Cooper: I cannot be at the meeting on the 13th. As I understand it, letters are going out to these men. You know how we stand. There has been some discussion and a motion was made. Shall we vote on it? All in favor will vote "aye." Those opposed say "nay." The "ayes" have it. It is unanimous.

B. Food enough: War and Postwar food goals

The Chairman introduced Director John R. Hutcheson to lead the discussion on this topic.

[A summary of Director Hutcheson's remarks will be found in Appendix G.]

DISCUSSION

In the discussion following Director Hutcheson's remarks it was suggested:

1. That a combination of a scarcity of farm labor and unfavorable weather might result in a wartime food shortage in certain sections, and of particular farm products. but that with favorable weather farmers should be able, in the main, to surmount difficulties due to shortages of labor and machinery.
2. That increased and more widespread use of fertilizers is essential for adequate food production during and after the war.

The Conference then adjourned for lunch.

At the luncheon session Dr. Harcourt A. Morgan, member of the Board of Directors, Tennessee Valley Authority, delivered an address on the subject of "The New Emphasis on the Land."

The Conference requested that a copy of Dr. Morgan's address be distributed to the members. Since Dr. Morgan spoke without notes, a digest of his address was prepared for this purpose.

[A copy of the digest of Dr. Morgan's address will be found in Appendix H.]

The Conference reconvened for the afternoon session at 2 p.m.

Dr. Corbett issued an invitation to include with the Land-Grant College group which is invited to go to Chicago April 13, Messrs. Jardine and Boatman of the U. S. Department of Agriculture.

The Conference then resumed discussion of the general topic: Farm programs, problems and outlook.

C. Health enough

Chairman Cooper introduced Dr. James T. Jardine, Chief of the Office of Experiment Stations, USDA, to lead the discussion of this topic.

[A summary of Dr. Jardine's remarks will be found in Appendix I.]

DISCUSSION

A question was raised about Dr. Jardine's reference to small size of farms as a factor in the problem:

It does look like a No. 1 problem when you talk about increased standard of living, but in nearly all reports there is some opportunity to better the conditions by application of the findings we have and more findings in raising and maintaining the level of soil fertility and in our crops and in a combination of crops. It seems to have some possibility in this whole problem. The size of the farm business can be increased within limits. It gives more latitude and a little more return per hour.

Bayer: The fact that it is an exception shows it can be done. Last year I was on a farm in Johnson County, in the Coastal Plain, of 18 acres. That man's total gross income for 1942 was \$3,748. We asked what he attributed his success to, and he said livestock. He is a man with a wife and two youngsters. They had five acres of cotton averaging seven bales; three acres of tobacco; two acres of wheat which averaged 40 bushels per acre; and two acres of pasture he cut out of woods. He used applications of phosphate and lime and had a carrying capacity of two cows to the acre but only had one cow. He carried two brood sows and several hundred chickens. He sold \$65 worth of dairy products, sold eggs to a hatchery, and sold pork other than what he had to use himself. He made the statement that the revenue he got from his little bit of dairy products and eggs and two hogs he sold paid all running expenses; and that the tobacco and cotton he sold was all clear profit.

Jardine: That is the only point I wanted to make. I am simply taking the problem from a factual research standpoint. I am trying to get at a few things that indicate something, that get at the complexity of research. While we want to produce higher nutrient quality food, that is a long-time job. We know we can stop erosion if we grow grass, but we can't eat grass. We will have more opportunity in the future if we work this whole combination. We cannot look to adding more and more fertilizer in general to improve the nutritive quality of the plants. We have only scratched the surface, and we cannot launch any big plan wisely just for the purpose of increasing vitamins and nutrients at this stage through fertilizer applications alone. From what we know now, I believe that we could produce probably 20 percent more feed if we had plenty of manpower, fertilizers and equipment.

Cooper: In our work in Kentucky, which we have carried on for some years, the question is the determination of phosphate, especially phosphorus. The plant has grown in our standard rotation in which we had an application of 200 pounds per acre of superphosphate; and my memory is that we have continuously shown in the production an increased quantity of P_2O_5 as compared to our check plot, this being on soils originally short of phosphorus.

Corbett: I know of a meeting that is being planned, with the idea that it is a proven fact that if we use more fertilizer we get better nutritional value.

Jardine: I know of no such programs. If I am all wrong, o.k.; I am just quoting.

Corbett: Since I have been with the Farm Bureau I had an Experiment Station director suggest an article based on this data for the "Nation's Agriculture."

Bayer: Where you have certain minor element deficiencies that is the case, from the standpoint of palatability. Take now, for example, the point Mr. Jardine raised in regard to comparison of plants with respect to animal nutrition. It is hard to tie down. If you improve the soil, you can get the kind of plants you want.

Kellogg: On vitamins - results with tomatoes in cultures have been negative and on alfalfa they have been positive in the field. Now, there is a lot of evidence that the mineral content of plants varies a great deal and that this can be controlled by fertilization to some extent, but it is not simply a matter of adding the particular element that may be lacking; rather it is a matter of adjusting the balance of all the nutrients. I think this is a true statement and that evidence will bear it out. Increased use of lime and phosphate in this Valley would have significant effects on the whole, but in specific cases there wouldn't be that effect because of the lack of other elements necessary for calcium and phosphorus intake. One man has been publishing a lot of popular articles along an extreme line and I hope he does not jeopardize the whole idea because his statements cannot be verified. One other point I should like to make is: we have talked so much about fertilizers that many may think that it is pretty easy to push our soils around. Fortunately, our soils are well buffered and not easily changed, otherwise with all the screwy ideas we have had with soil fertility we might be starving to death. The conditions of the natural soil type is probably more important than cultural practice. Cultural practice is

important, but one of the most important things we have got to do is to adjust our food crops to the soil conditions and not try to make our soils all uniform. There is a great opportunity along these lines. When we change the types of crops grown by proper fertilization, then adjust our food crops to the soil types, we will have better food.

Jardine: Will you agree with me that we have hardly scratched the surface?

Kellogg: Yes. We have always got to remind ourselves that we are talking about fertilizer in order to increase efficiency. Now, that is always on the assumption that we are going to do other efficient things too. On the matter of conservation, if we are going to have a national policy for conservation we should see to it that all land has the basic mineral supply necessary to keep efficient production. It is wasting labor to get 20 bushels of corn when we can get 60.

This concluded the discussion of the general topic: Farm programs, problems and outlook.

III. Current valley research program

The Chairman introduced Director L. D. Bayer to lead the discussion on the first phase of this topic.

[A summary of Director Bayer's remarks will be found in Appendix J.]

At the conclusion of Director Bayer's remarks, the Chairman introduced Assistant Director J. H. McLeod to lead the discussion on the second phase of the general topic.

Subtopic: Possible methods of improving the test-demonstration farm program and achieving more effective utilization of its results.

DISCUSSION

McLeod: We thought the best approach to our topic would be to take some county and make a special study, and that is what we have done. We have a couple of men who have been working on some of the data, Mr. Callahan and Mr. York. This afternoon I am going to give you a treat. You can listen to a fellow on the ground: Mr. York.

[A summary of Mr. York's remarks will be found in Appendix K.]

McLeod: They have done a fine job. This does show what a real problem we have with these small farms. The thing we have talked about today was a bigger problem than we anticipated. I was on a farm in one of the counties the other day where the farmer had started keeping records in about 1935. He has carried the record on to 1942. The assistant county agent figured out that the food now produced by this man would carry four times as many soldiers as the food which he produced in 1935, when he started, would have carried. It is a typical farm. He made about 1-3/4 times more in 1943 than in the year he started out.

At this point, commenting on the work described by Mr. York, Dr. Charles E. Kellogg, Chief of the Division of Soil Survey, Utah, made an oral statement to the conference regarding the scope and importance of a systematic classification and analysis of farms, based on their physical and economic characteristics, as a basis for formulating and carrying out the agricultural program of the Valley.

The Chairman requested Dr. Kellogg to provide the Secretary with a written copy of his remarks for distribution to members of the Conference.

[A copy of Dr. Kellogg's memorandum will be found in Appendix L.]

McAmis: I would like to see this county as completely finished as the boys feel they can do it and kept that way. The next point I would like to emphasize is that I would like to see in each state some similar undertaking in representative counties, and the more assistant county agents who can do this, the better I would like it. Clyde, I think, has done much of this work, he and the county agent together. We need this very badly.

Hutcheson: Manpower will do the job. I think this is one particular job where the assistant county agent can help the county agent. I think we ought to begin going in this direction as fast as we can.

Kellogg: If we had had this kind of framework in the beginning, would you have had much extra work?

York: We could have avoided a lot of lost motion if we had had this in the beginning.

Kellogg: Would the total work load be increased?

York: It is going to take concentration of effort at the outset, but, in the long run, both time and effort will be saved.

This concluded the discussion of the general topic: Current valley research program.

The Chairman introduced Mr. J. L. Boatman, member of the Correlating Committee, representing the USDA, to present certain recommendations of that Committee for consideration by the Conference.

Boatman: First I want to make a few introductory remarks. What I am going to read is something the Correlating Committee has given serious consideration. I am going to present this statement with more assurance today than I felt that I might last night. In so many of the discussions here today so many have implied that we lack the mechanics for getting things done. That has been brought out in a good many discussions today. What the Correlating Committee has tried to do is to interpret the Memorandum of Understanding which provides for cooperation in the Valley program and suggest procedures to the group for your consideration and your discussion. I am going to read the recommendations suggested for consideration by the Correlating Committee.

Mr. Boatman then read as follows:

The Committee considered the following recommendations and agreed to ask Mr. Boatman to submit them on behalf of the Committee to the Valley States Conference at its meeting in Knoxville on April 3, 1944:

1. That, in States where such action has not already been taken, the Director of the Experiment Station and the Director of Extension in the respective States select and officially designate to the Executive Secretary a State Contact Officer, as provided for under the Memorandum of Understanding.
2. That each proposal for the initiation or renewal of any "joint coordinated activity" under the Memorandum of Understanding, prior to its initiation or renewal, be referred to the Correlating Committee in accordance with the following procedure:
 - a. The proposal will be referred to the Executive Secretary who, if he deems the proposal to be clearly in accord with the established policies under the Memorandum of Understanding and to be procedurally and methodologically adapted to the furthering of the agricultural program in the Tennessee Valley, and after securing such administrative and technical advice as he may deem appropriate in arriving at these determinations, may clear the proposal on behalf of the Correlating Committee.
 - b. In the event the Executive Secretary deems that questions of policy, procedure, or method raise a presumption against clearance of the proposal for inclusion as a "joint coordinated

activity" under the Memorandum of Understanding, he will refer the proposal to the Chairman of the Correlating Committee, who, on his own initiative may clear the proposal, provided he is satisfied that no questions of policy, procedure, or method are involved that justify submission of the proposal to the Correlating Committee.

- c. A proposal which neither the Chairman nor the Executive Secretary of the Correlating Committee finds eligible for clearance under the considerations stated will then be submitted to the Correlating Committee for approval or rejection and appropriate recommendations to the interested agencies.
- d. No proposal for the initiation or renewal of a joint coordinated activity under the Memorandum of Understanding may be disapproved under this procedure except by action of the Correlating Committee.

5. That the following standing committees of the Conference, each to consist of a chairman and two members of the Conference to be appointed by the Chairman of the Conference, and such additional members as the Chairmen of the respective committees may from time to time select from among the personnel of the participating agencies and institutions, are authorized and established:

- a. Committee on Organization: To consider and make recommendations to the Conference regarding such procedural and organizational arrangements, consistent with established policies, as the committee believes will tend to facilitate and promote the effective development and carrying out of the joint coordinated activity contemplated under the Memorandum of Understanding.
- b. Committee on Research: To prepare and submit to the Conference an annual or semi-annual report, with recommendations, relating to current and needed research in connection with the joint agricultural program in the Tennessee Valley, including a digest and interpretation of the results of current research, and proposals as to the character and scope of research problems requiring joint investigation, together with suggestions as to the allocation of this work among the participating agencies.
- c. Committee on Extension: To prepare and submit to the Conference an annual or semi-annual report, with recommendations, relating to the extension activities in the Tennessee Valley conducted as a joint coordinated activity under the Memorandum of Understanding, including suggestions as to the expansion or modification of the scope and character of extension activities to facilitate better understanding and application of the joint agricultural program in the Tennessee Valley.

- d. Committee on Resource Utilization: To prepare and submit to the Conference an annual or semi-annual report, with recommendations, relating to actual and needed shifts in the use of land for agriculture (including forestry) and other purposes; supplies of fertilizer, quantities used, and quantities needed in the agriculture of the Valley; agricultural and industrial relationships; farm, family and community organization and problems; local industries; cooperative organizations, etc.
4. That the functions and work of the present committees of the Conference be appropriately allocated among the Standing Committees.
 5. That the Executive Secretary shall be a member ex officio and shall serve as Secretary of each Standing Committee of the Conference; that it is recommended that he be requested to serve, also, as Secretary of such special committees as may from time to time be established by any of the participating agencies in conjunction with the carrying out of any joint coordinated activity under the Memorandum of Understanding.
 6. That the Committee on Organization be instructed to consider, and make recommendations to the Conference on, the feasibility of utilizing the specialized technical staff of one of the participating institutions, or of establishing and financing a specialized technical joint-staff of full-time employees, or any alternative unified, systematic, and adequate arrangement and procedure (a) to advise the Correlating Committee with respect to the statistical and methodological adequacy of the procedure proposed for any joint coordinated activity involving the application of research techniques and (b) to tabulate and correlate, on request of the Executive Secretary, the results of such joint research, so as to show their significance, degree of comparability, and range of applicability.

The Conference then proceeded to discuss the recommendations pertinent

On motion of Davis, seconded by Brahm, the action and procedure as proposed in recommendations 1 and 2 were adopted.

Recommendations 3, 4 and 5 relating to standing committees were then discussed.

At the suggestion of Davis, recommendation 5 was amended to read as follows:

That the Executive Secretary shall serve as Secretary of each Standing Committee of the Conference; that it is recommended that he be requested to serve, also, as

Secretary of such special committees as may from time to time be established by any of the participating agencies in conjunction with the carrying out of any joint coordinated activity under the Memorandum of Understanding.

On motion of Davis, seconded by Bayer, recommendations 3 and 4 and 5, as amended, relating to standing committees were adopted.

Director Bayer proposed that recommendation 6 be amended to read as follows:

That the Committee on Organization be instructed to consider, and make recommendations to the Conference on, the feasibility of utilizing the specialized technical staff of one of the participating institutions, or of establishing and financing a specialized technical joint-staff of full-time employees, or any alternative arrangement and procedure to help the Research Committee discharge its functions (a) by assisting and advising with respect to the statistical and methodological adequacy of the procedures proposed for any joint coordinated activity involving the application of research techniques, and (b) by tabulating and correlating the results of such joint research, so as to show their significance, degree of comparability, and range of applicability.

On motion of Prohn, seconded by Hutcheson, recommendation 6, as amended, was adopted.

A copy of the recommendations as amended and adopted by the Conference will be found in Appendix M.7

On motion of Prohn, seconded by Hutcheson, the Conference voted to hold its next meeting on Tuesday, October 3, 1944. On motion of Hutcheson, seconded by Jones, the Conference voted to hold its next meeting in Birmingham, Alabama.

The Chairman instructed the Executive Secretary to make the necessary arrangements for the meeting.

The Conference adjourned at 5:30 p.m.

Respectfully submitted,

C. F. Clayton
Secretary

APPENDIX

TWENTY-FIRST VALLEY-STATES CONFERENCE

Hotel Andrew Johnson, Knoxville, Tennessee
April 3, 1944

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APPENDIX A

TWENTY-FIRST VALLEY-STATES CONFERENCE

Hotel Andrew Johnson, Knoxville, Tennessee
April 3, 1944

ROLL OF CONFERENCE

Alabama

Davis, P. O., Director, Agricultural Extension Service, Auburn
Williamson, J. T., Associate Agronomist, representing M. J. Williamson,
Director, Agricultural Experiment Station, Auburn

Arkansas

None present

Florida

None present

Georgia

Brown, Walter S., Director, Agricultural Extension Service, Athens
Stuckey, H. P., Director, Agricultural Experiment Station, Experiment

Kentucky

Cooper, Thomas P., Dean, College of Agriculture, Lexington

Louisiana

Reark, C. B., Assistant Farm Management Specialist, representing
H. C. Sanders, Director, Extension Service, Baton Rouge

Mississippi

Dorman, Clarence, Director, Agricultural Experiment Station, Delta
College
Jones, L. I., Director, Agricultural Extension Service, Delta College

North Carolina

Baker, L. D., Director, Agricultural Experiment Station, Raleigh
Schaub, I. O., Director, Agricultural Extension Service, Raleigh

South Carolina

None present

Brehm, C. E., Director, Agricultural Extension Service, Knoxville
Callahan, H. P., Assistant in Farm Management, Agricultural Extension Service, Knoxville
Hofford, J. H., Assistant Director, Agricultural Extension Service, Knoxville
Moore, C. A., Director, Agricultural Experiment Station, Knoxville
York, Clyde, Assistant County Agent, Jefferson County

Virginia

Drinkard, A. W., Director, Agricultural Experiment Station, Blacksburg
Hitcheson, J. R., Director, Agricultural Extension Service, Blacksburg

Tennessee Valley Authority

Hobbs, J. C., Director, Agricultural Relations Department, Knoxville
Morgan, H. A., Member of Board of Directors, Knoxville

U. S. Department of Agriculture

Boatman, J. L., Chief, Division of Subject Matter, Agricultural Extension Service, Washington
Jordan, James T., Chief, Office of Experiment Stations, Washington
Tolliver, Charles E., Chief, Division of Soil Survey, Bureau of Plant Industry, Washington
McArdle, R. E., Director, Appalachian Forest Experiment Station, Asheville, N. C.

Correlating Committee

Cooper, Thomas P., Chairman, representing Land-Grant Colleges, Lexington, Kentucky
Boatman, J. L., representing U. S. Department of Agriculture, Washington, D. C.
Hobbs, J. C., representing Tennessee Valley Authority, Knoxville, Tennessee
Clayton, C. F., Executive Secretary, Knoxville, Tennessee

American Farm Bureau Federation

Corbett, Roger B., Secretary, Chicago, Illinois

APPENDIX D

TWENTY-FIRST VALLEY-STATES CORRELATING CONFERENCE

Hotel Andrew Johnson, Knoxville, Tennessee
Monday, April 3, 1944

PROGRAM

MORNING SESSION
(9:00 A. M. - 12:30 P. M.)

9:00 - 9:15 Opening of the conference Chairman Thomas F. Lamm

I. Agricultural-industrial relationships, problems,
and outlook

(More power to agriculture: agricultural and industrial implications of making a larger portion of TVA power available to farmers and farm families in the Valley; relationship to need for labor and machinery. Rural community and farm industries: what they are and what it takes to get them; progress and outlook for new and improved methods for local processing of farm products and for facilitating soil conservation and farm development; relationship to need for labor and machinery. Cooperative and community organizations)

9:15 - 9:30 Discussion Leader I. O. Schaub

9:30 - 10:15 Discussion

II. Farm programs, problems, and outlook

A. Fertilizer enough

(Fertilizer supply in relation to quantity needed for agricultural development; current national figures on production, use, and requirements for fertilizer; official statement of War Food Administration; estimates of BAE; estimates of Tennessee Valley States; statement of Phosphate Committee of the Association of Land-Grant Colleges and Universities; statement of American Farm Bureau Federation. Tennessee phosphate deposits in relation to the Valley program)

Discussion Leaders Thomas P. Cooper
C. A. Mooers

10:45 - 11:30 Discussion

Discussion

B. Food enough: war and post-war food goals.

(How to get the kind and quantity of food we need with the kind of farming we ought to have; acreage versus production goals; relationship to need for labor and machinery. The place of the test-demonstration farm program in war and post-war food production)

11:30 - 11:45 Discussion Leader John R. Hutcheson

Discussion Leader John R. Hutcheson

11:45 - 12:30 Discussion

Discussion

LUNCHEON SESSION
(12:30 P. M. - 2:00 P. M.)

Dr. Harcourt A. Morgan, member of the Board of the Tennessee Valley Authority, will address the luncheon session on the topic: Resource Development and Research.

100 100 100

AFTERNOON SESSION
(2:00 P. M. - 5:30 P. M.)

II. Farm programs, problems, and outlook - continued

C. Health enough

(Types and results of research in progress and current problems of research on the relation of the maintenance of soil fertility to human and animal nutrition and food and feed production)

2:00 - 2:15 Discussion Leader J. T. Jardine

Discussion Leader J. T. Jardine

2:15 - 3:00 Discussion

Discussion

III. Current Valley research program

(The nitrogen problem; ammonium nitrate; liquid ammonia (the Wilson Dam conference); fused

Possible methods of improving the test-demonstration farm program and achieving more effective utilization of its results)

3:30 - 4:15 Discussion

(Summary of the recommendations and suggestions developed in the conference discussions and submission to the conference for action of specific proposals and recommendations relating to such matters as organization, policy, and program)

4:30 - 5:15 Discussion

5:30 VI. Adjournment of the conference

APPENDIX C

Agricultural-industrial relationships, problems, and outlook

Presented by Dr. L. O. Schaub at the Twenty-Fifth Valley States Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes page 2)

Schaub: I have been thinking about some of our mountain counties in the Valley that are almost wholly agricultural, and I think a similar situation prevails in a good many counties in other Valley areas. They have depended in the past on forestry, of course, as a supplementary source of income, but those resources are about exhausted. I have been thinking--looking a little toward the future--call it postwar planning or what not--what should be our objective. We have got to do something that will not only improve their agriculture but will likewise carry some kind of industrial development that will give them side employment.

I will use an extreme case so far as one county is concerned. It is mostly rural, in fact almost wholly rural. They produce some grain and crops of that kind; have done quite a bit along the poultry line; have raised hogs for home consumption; and have begun to work along the dairy line. I think that we need to tie right in at this point with some development of industry--the manufacturing side of it--that will take their poultry and their eggs and process them at this point for distribution. I am thinking it would be true of dairying, and also I think there is a possibility of standardizing their manufactured meats--pork and bacon--that would command a premium in the market; and if we move along that line it will stimulate them to further effort toward crop production. That is going to take manufacturing plants of one kind or another. While they need not be large, it will give surplus employment to some of the people.

Most of the county is largely in woods. We may have to find outlets for new types of forest products there or better utilization of species we are now growing. Something of that kind can develop into some kind of manufacturing plant, and that is going to take some more current. Using Clay County as an illustration, I can see some real possibilities there.

That is about all I can suggest to open this discussion. I am a firm believer that we need local industrial development that will furnish part-time employment to people in the Valley who cannot, under the size of the farms that we have, really keep themselves occupied on a 12 months' basis.

Now, coming to the development of that industry, organizing it, I get involved in my own thinking, and I don't know how we are going to get them organized--whether by means of cooperatives, private plants, or how.

Cooper: Dean, I wonder if I can ask a question that might be a little presumptuous. Do you really think there is anything to this industrialization of agriculture? Does our experience, in the places you can point to where something has been done, show it is a good thing? I have been aching to ask someone that question.

Schaub: Caldwell County has developed industrially without concentrating all these workers in the town. They draw on a radius of about 20 miles where the farms are comparatively small. We don't think of it as a large agricultural-producing county. Perhaps three-fourths of the workers in these plants live in rural homes with an average acreage of 10 to 30 acres. Some of the members of the family stay at home and operate the farm while others work in the plant. When you hit a depression period they are shock absorbers. These families don't have to have charity help because they have their farms to fall back on. I am convinced that is the proper development. I know of another area where farms have almost become depopulated, where they have gone into industrial plants, and they all belong to CIO. When a depression hits they are going back on farms. Now they have gone into factories because wages are so high.

APPENDIX D

Food program, problems, and outlook: fertilizer program

/Data presented by Dean Thomas P. Cooper at the Twenty-First Valley States Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes, page 4.)

Triple Superphosphate*

	<u>1943-44^a</u> (Tons)	<u>1944-45^a</u> (Tons)
Prospective Production	275,000	325,000 to 350,000
Allocated to United Kingdom	152,000	100,000
Reserved for American Use--		
Tons of material	123,000	225,000 to 250,000
Tons of P_2O_5	55,350	102,250 to 112,500

Importations of Ammonium Phosphate (Amnophos) from Trail, B.S., Canada, 1944-45^a

<u>Analysis</u>	<u>Tons</u>	
11-48-0	35,000) Tons P_2O_5
16-20-0	50,000) 27,000

The shortage of labor, of bags and of freight car space will make desirable, if not necessary, an increase in plant food concentration in mixed fertilizers. Most of the increased tonnage of triple superphosphate which will be available for use as fertilizers during the coming year will probably be used in higher analysis mixed fertilizers. Triple superphosphate is a requisite of higher analysis mixtures, but for such purposes it can be displaced by ammonium phosphate.

* Official statements issued by War Food Administration at various times.

Ordinary Superphosphate

	<u>13%</u> <u>(Tons)</u>	<u>P₂O₅</u> <u>(Tons)</u>
"Ideal" capacity July 1, 1943	8,555,000*	1,534,000
"Ideal" capacity January 1, 1945	<u>1/</u> 8,992,000	1,618,000
Actual production year ended June 30, 1943	8,800,000*	1,614,000
Estimated actual production 1943-44	6,900,000*	1,242,000
Estimated actual production 1944-45	8,000,000*	1,440,000

The prospective shortage of ordinary superphosphate for 1944-45 is dependent upon a continuous movement of sulphuric acid free ordnance plants throughout the year. At times during the 1943-44 season, the shortage of sulphuric acid handicapped production of superphosphate. Since sufficient supplies of sulphuric acid are in sight for 1944-45, it is not expected to become a bottleneck in the production of superphosphate next year.

Prospective Total Supply of Phosphates Available for Agriculture (In tons of P₂O₅)

Superphosphate

	<u>Triple</u>	<u>Ordinary</u>	<u>Amphos</u>	<u>Total</u>
1943-44	55,350	1,242,200	--	1,297,350
1944-45	102,250 to 112,500	1,440,000	27,000	1,579,500

Nitrogen (Supply for 1943-44 by Materials)^{2/}

	<u>Tons of Material</u>	<u>Tons of Nitrogen</u>
Ammonium Sulphate	963,114	192,600
Synthetic Nitrate of Soda	330,000	52,300
Cal-Nitro	55,000	11,275
Cyanamid	99,888	20,477
Uramon	27,000	11,340
Chilean Nitrate of Soda	650,000	104,000
Nitrogen Solutions	--	139,500
Organics	--	30,000
Ammonium Nitrate	310,000	103,618
16-20 Ammo-phos	57,020	9,125
11-48 Ammo-phos	17,250	1,900
Total N		676,135

* Official statements issued by War Food Administration at various times.

1/ "Ideal" capacity - "The Fertilizer Outlook, 1943-44" prepared by WFA, plus 437,000 ton capacity announced by WFB (WFB-1D-21-March 29, 1944)

2/ Nitrogen supply 1943-44, Chemicals and Fertilizers Branch, WFA, 10-1-43. Revised 2-1-44.

Of the total 676,135 tons nitrogen supply, 30,407 tons are being exported to Hawaii and Puerto Rico. The balance will be used in mixed fertilizers and for direct application.

Prospective Nitrogen Supply for 1944-45 by Materials

No substantial net changes in supply of nitrogen of soda, sulphate of ammonium, cyanide, urea, organic nitrogen and ammonium phosphates will be available in 1944-45 as compared with 1943-44, but increased potential supplies of ammonium nitrate and nitrogen solutions are in prospect, which should provide an approximate total of from 745,000 tons to 775,000 tons of nitrogen to be used in agriculture during the coming year. Of this total, it is estimated that 40,000 tons will be exported to Puerto Rico and Hawaii.

Potash

	<u>3/ 1942-43</u>	<u>4/ 1943-44</u>	<u>5/ 1944-45</u>
	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>
Prospective tonnage available for use in agriculture	589,934	586,160	675,000

Domestic production of potash in 1944-45 is expected to amount to 2,500,000 tons of which 125,000 tons are reserved to go to chemical industries and for export. It may be possible that potash from Spain may take the place of part of our estimated exports and increase the amount available for fertilizer use in the United States. The increase in potash will be in the form of high grade muriate.

Total Prospective Supply of Plant Foods Available for Use in 1944-45

Continental U. S.

(Tons)

Nitrogen	705,000 to 725,000
Phosphoric Acid	1,568,250 to 1,579,500
Potash	675,000

Mixed Fertilizer

The tonnage of mixed fertilizer in 1944-45 is expected to increase somewhat, 10 percent over 1943-44. The tendency is for concentration to be higher.

3/ Fertilizer Outlook, 1943-44 at WPA Fertilizer Advisory Committee meeting.

4/ Fertilizer War Notes No. 41, NFA.

2/ Kieffer, Dale C., Report at WPA Fertilizer Advisory Committee meeting, Jan. 26, 1944.

5/ Kieffer, Dale C., Report at WPA Fertilizer Advisory Committee meeting, March 9, 1944.

National Needs

This forecast is based on the relationship between farm income and expenditure for fertilizers prepared by A. L. Mehring and B. T. Shaw.

	<u>Continental U.S.</u> (Tons)	<u>Territories</u> (Tons)	<u>Total U.S.</u> (Tons)
Nitrogen	692,000	35,000	727,000
Phosphoric Acid	1,294,000	15,000	1,309,000
Potash	722,000	23,000	745,000

Fertilizer needs of the Tennessee Valley Region

(Condensed from statements of needs by
the Land-Grant Colleges)

	<u>Nitrogen</u> (Tons)	<u>P₂O₅</u> (Tons)	<u>K₂O</u> (Tons)	<u>Line</u> (Tons)
Alabama <u>6/</u>	19,150	67,450	27,475	500,000
Georgia <u>7/</u>	1,012	9,726	1,684	117,282
Kentucky <u>8/</u>	5,434	7,569	5,076	225,790
Mississippi <u>9/</u>	4,066	6,748	1,154	194,303
North Carolina <u>10/</u>	7,415	13,254	5,920	183,745
Tennessee <u>11/</u>	17,896	68,258	26,882	1,080,537
Virginia <u>12/</u>	8,573	25,719	16,149	244,821
Tennessee Valley: Total	63,546	198,724	84,340	2,546,478

6/ Calculations are based on eight years experience with unit and area test-demonstrations and reorganizing the land use and cropping practices in the area to provide the maximum soil and water conservation and utilization and a productivity level that will contribute the maximum to the income and the stability of the people.

7/ Based on the assumption that the farmers in the Tennessee Valley Counties if furnished proper information would continue to use or perhaps increase the normal amounts of mixed fertilizers and the estimate of 1-25-44 for phosphates and limestone on the productive crop and pasture land in these counties.

APPENDIX B

Phosphate problem and solution: Fertilizer program

Summary of remarks made by Dr. Roger L. Corbitt at the Twenty-Fifth Valley Farm Conference, Knoxville, Tennessee, April 1, 1939 (See text of Minutes page 5)7

What I am talking about is of a necessity semi-confidential. I am naturally at a loss to know where you may use in your thinking. The extension principle of "you must start where a man is" holds true. I judge some of you men are well informed on this problem and some of you are even less informed than I am, which means your information is small indeed. I shall mention briefly some history and then outline the objectives we are trying to reach and then tell the methods that may be used to reach these objectives. I want to raise your sights and ask you to consider, not present situations, but where you are going to be 100 years hence. Will you think not only of the states represented here but of the whole nation and agriculture's welfare? It is a long-time national program we have in mind.

The first step leading to this was made in a report by land-grant colleges in 1933 and 1934. The American Farm Bureau also had a report from a committee of its own. Soon after that a national phosphate committee was set up by the land-grant colleges with President Peterson of Utah as Chairman. This Committee reported last October and said that we must increase the use of phosphate from 1.1 million tons to 3.4 million tons if soil fertility is to be maintained. About 1939 or 1940 some cooperative associations got together and began talking about this problem and formed an association for future study.

In January of this year the Executive Committee of the American Farm Bureau Association set up a staff committee composed of General Russell Kirkpatrick and myself. We presented to the Board of the Farm Bureau (on the second day of March) a report--20 some pages--with some additional supplementary material. In addition, we presented a brief report so that he who runs can read. In these reports is a summary of virtually everything that has been done along this line in the United States. We got all we could from TVA; we got all we could from the land-grant colleges. We got Dr. Searseth, Head of the Agronomy Department at Purdue, to advise us. Thus we feel we have a good report because of the help we received. Several meetings have been held with Farm Bureau leaders where this problem and program have been discussed. There is a good deal of interest among Farm Bureau leaders and a growing belief that we need a national fertilizer program.

A point that men expressed me is a map of the United States, showing the sources of phosphate rock. One source is TVA in Tennessee. It is just a little point on the map. Another source is in Florida. and in

is several times larger than the TVA source. Then in Utah, Idaho, and Wyoming there is a huge source several times larger than that in Florida. The little source is the one we are exploiting. I have heard it estimated that it will become exhausted in from 20 to 50 years. You men have a very very definite interest because your nearby supply is going to disappear within the span of a lifetime.

Recently a group of farm leaders stated that in the Midwest we are going to buy fertilizers in quantities unheard of at present. They felt that agriculture had better do something to get prepared for this demand.

I am putting around some maps which will show you the high-lights of a proposed program to meet the situation we have been discussing. This gives the heart of a proposed national program. It has to do with the development of five plants scattered over the nation. A Florida plant which will work with sources of rock in Florida. Then, the territory that will be supplied from the small reserves in Tennessee. A Mobile, Alabama, plant with rock coming from Florida. Then a plant is proposed at New Orleans. A plant is suggested in about that place where Wyoming, Idaho and Utah come together. This last plant to be coordinated with a potash plant. That gives you an idea of the program. The development of those five sources is a nation-wide program.

The last point is, how to get it done--methods. Three recommendations were made to the American Farm Bureau Board. These plants should be owned, controlled, and operated by private or cooperative capital. The pattern that has been set up by TVA will be undisturbed, but the new plants are to be owned, controlled, and operated by private enterprise, eventually if not from the outset. What we are talking about is just a fraction of the total supply, around 5 percent. We are trying to set up a yardstick and an experiment. This program with its educational and demonstrational phases may cost 50 to 60 million dollars. The best-demonstration work would be carried on by Land-grant Colleges. If it is possible, we would suggest that the farm organizations finance this program and carry it out. The alternative is to set up a loan and revolving fund in a government agency--maybe the Farm Credit Administration. After a period of years, part of the loan would be written off, and the farmers would take over. Another thought is that the whole thing be set up by the Government, but in such a way that it can be taken over by private interest. Eventually all three plans would result in the private ownership and control.

APPENDIX F

Summary of remarks, problems, and outlook: Fertilizer sources--the phosphate deposits in relation to the Valley program

/Summary of remarks made by Director C. A. Moore at the Twenty-First Valley States Conference, Knoxville, Tennessee, April 1, 1941
text of Minutes page 617

All I can do after the talk that has just been made (See Remarks of Dr. Roger B. Corbett, Appendix E) is to emphasize the necessity that something be done if we are to preserve the phosphate deposits in this section for the good of the Valley area. As has been said, the great deposits are in the West, and they are practically unused at the present time. The Florida deposits are very large and amount to about one-third of those in the West. Perhaps there are two billion tons of phosphate in Florida. The Tennessee deposits are small, about one-tenth of what are found in Florida. That means roughly two hundred million tons.

At first sight that sounds like a large amount. Actually, the deposits that can be mined commercially to advantage amount to perhaps one hundred million tons. That is brown rock. Brown rock is the only kind that can be mined to advantage. Plate rock is already gone. What they have to do is use low-grade muck, and that has to be washed, two tons making one ton of high-grade rock. That is a handicap right at the start--if we consider that the deposits in Florida are ten times what we have here, and then consider that Tennessee rock is actually furnishing at the present time one-third of all the phosphate used and then consider that that is due largely to the cheaper electric current which is available here. Really three plants are making use of most of it: The Victor Chemical Company, The Monsanto Chemical Company, and TVA. And they are using it largely for war purposes. Actually, heavy shipments have been made in the Lend-Lease program to Great Britain. The phosphate deposits in Tennessee are small but are producing about one-third of all phosphate being made in the country. The deposits are being rapidly depleted. We can't get plate rock; we have to use muck. It is being drained away to states in the North for war purposes, and even shipped to England to help them out.

To sum the matter up, if present use were continued for perhaps 50 years, we would be almost without phosphate from this source. These figures are given merely to show the necessity of something being done to keep these deposits for use here in Tennessee and neighboring states.

APPENDIX G

Farm programs, problems, and outlook: Food enough--War and postwar food goals

Summary of remarks made by Director J. R. Rutheford at the Twenty-First Valley District Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes page 8)

The topic is "Food Enough for War and Postwar Conditions." I make it that all of us here are immediately concerned with food enough to win the war. I blow hot and then I blow cold on the proposition. We go out in the fall and say that there is a greater demand for food in 1944 than there has ever been in the history of the world and a greater food shortage. We come up two or three months later and say by implication, now we have got enough food to win the war but say we need more manpower in the fighting services, and if manpower cuts down production on the farm, o.k., if the men at the top say so. Maybe they don't mean that. Maybe they mean we have got to produce the food under abnormal labor conditions.

I am going to discuss briefly the way we look at it from our standpoint.

We know the War Foods Administration has asked every farmer to produce 5 percent more food than he did last year. Approximately, we know (by an actual survey of 7500 neighborhood leaders with 6000 definite replies) that we have 9.1 fewer men on farms at this time this year and 21.0 less boys between 14 and 18 than we had a year ago. We know, in addition, the Selective Service has said definitely that no one, between the ages of 15 and 17, left on the farm should be deferred, unless he is producing 16 war units by his own individual efforts. We understand that that is being changed. I don't know. I sat in a meeting of a Selective Service board in our State recently. Someone said as though it might blow us up instead of blow us down. He said definitely they were going to take more men off the farm. Of course, he is just one man. I understood from what was reported in the papers that General Hershoy made a two-way motion on this thing. He said we will do away with 15 units, and you must take some notice of the Tydings Amendment, but we have to have more voices. We can produce 5 percent more food with 10 percent less manpower. We thought we worked pretty hard last year. If only men were left who would have 16 units, that would mean the ones left from June to September would work from 15 to 18 hours a day. That's pretty hard.

No, of course, figure theoretically we are going to get a lot of labor from women, children and farm men who are going to come out of the army. But up to now we have watched the people coming out. The army is dismissing around 70,000 a month, and I'd say around 5 percent of those are going back into agriculture. That's a guess--just a figure. We have talked to a lot of the boys who have come out of the service.

Right out of ten say they can get \$35 to \$50 a week in industry any day they wanted to go to work. We are not going to get any more labor than we have, and I doubt whether we are going to plant any more acres. We thought we would run up against this situation. I never believed they weren't going to take men. We have tried to delay this process somewhat in view of our opinion whether we had food enough, the topic of this talk. If the war lasts two years longer--an authority said it could last three--we are just beginning to tighten up on this thing.

Now, in looking around, how are we going to get at this thing? How are we going to have food enough if we are not going to get any more land into cultivation. We have got to produce more on land in cultivation. I don't think anybody here will argue with that for a moment. The only way we can produce more--at least the main way--is through additional use of plant food on the acres we have. We campaigned every county, and every community, and every neighborhood and asked them to double the amount of fertilizer they were going to use. These people ordered their fertilizer. We asked them in December to order fertilizer. The fertilizer distributors in the State tell us that orders are twice what they normally are at this point. Some of them in the potato section, where it has been raining about a month, should have planted the potatoes in March. Fifteen percent are planted now. Some of you have had a similar experience.

I want to spend the rest of the time in giving you some results we think we have gotten from the increased use of phosphate in the Tennessee Valley counties of our State. We have 700 to 900 unit-demonstration farms. We have 26 areas that have 1500 farms in them. Over half of these keep records. I took this from a report of a man who makes reports to me. He picked out 4 or 6 of these farms as representative of unit farms to see what has happened. The average total income increased. Using the 1935 price index all the way through, the average crop yield increased 36 percent since 1935; the purchase of commercial fertilizer and lime has practically doubled through this period; the labor efficiency on these farms increased 20 percent; average productive work-day 180-220; acres of pasture decreased from 4 to 3 acres; grazing capacity of pastures increased 33-1/3 percent. Animal units on these farms increased 24 percent. Based on clipped weights, the average increase by using phosphate and lime was 40 percent over checks. That is a pretty good indication to me that in that type of agriculture, where you increase forage crops and where you increase pasture, increased fertilization pays large returns. The man who drew up these figures for me says, judging from the above trend on demonstration and non-demonstration plots, there seemed to be some increase in feed production. Further studies of over 500 unit and area farm records show an increase of one-third during the past four to five years, and with less manpower. I believe that in consideration of these things, we have got to have wider and increased use of fertilizers, not only to get food enough during the war but to stay in the game after the war.

APPENDIX H

The new emphasis on the land

Synopsis of remarks made by Dr. H. A. Morgan at the Twenty-First Valley States Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes, page 8)⁷

April 7, 1944

TO MEMBERS OF THE VALLEY STATES CONFERENCE:

At the luncheon session of the meeting of the Valley States Conference in Knoxville, on April 3, Dr. Harcourt A. Morgan delivered an address on the subject of "The New Emphasis on the Land".

The conference unanimously requested that copies of Dr. Morgan's address be distributed to the members. Since Dr. Morgan spoke without notes, no copy of his address precisely as delivered at the luncheon is available. Fortunately, however, mimeographed copies of an address delivered by Dr. Morgan before the annual meeting of the Tennessee Farm Bureau Federation, in Memphis, Tennessee, on November 8, 1943, are available. A copy of this address is enclosed. While differing in emphasis, the address delivered at Memphis embodies the same fundamental conceptions developed by Dr. Morgan in his address at the luncheon session.

There is enclosed, also, a copy of the Tennessee Farm Bureau News of January 6, 1944, which contains, in addition to a reprint of Dr. Morgan's speech, an article on page 1, by J. F. Porter, entitled "A Look-Ahead", and an editorial on page 3, entitled "To Chart A True Course". You will find both Mr. Porter's article and the editorial of interest in connection with Dr. Morgan's address.

As noted, Dr. Morgan's remarks at the luncheon were directed to "The New Emphasis on the Land". Dr. Morgan based his remarks upon three fundamentals, which you will find stated in the Memphis address on the pages indicated.

1. That there is an elementary or natural relationship between nature and man. Under this relationship nature creates and man discovers (page 1).
2. The joint contributions of nature and man constitute the "common moorings of humanity" (page 1).

3. That when this natural relationship between nature and man is allowed to function, the result is an enhancement of the productive resources of nature. Man, through the processes of research and experience, is able to discover more and more of the principles that underlie man-nature relationships. Man is thus enabled to adapt his methods of using the energy provided by nature so as to draw a maximum from nature's inexhaustible sources (air, water, land) and thus achieve maximum conservation of nature's exhaustible (coal, oil, gas) sources (pages 4-6).

Proceeding from these principles, Dr. Morgan emphasized that the crisis we face results from man's failure to cooperate in nature's plan. He states the case in his Memphis address by saying "that cross currents of humanity in this storm tossed world have disrupted us from the harbor or mooring from which Christianity and democracy set sail" (page 2).

The challenge presented by this crisis was the central theme of Dr. Morgan's discussion at the luncheon session on "The New Emphasis on the Land". Four things are essential to meet the crisis, Dr. Morgan pointed out:

1. Integration. "Nature has set unmistakable patterns in planning, conservation, and economy for her companion man. On an occasion such as this, time permits only the discussion of the high points of the companionship. It seems clear, however, that urban populations are not exempt from the partnership with nature. The conservation and intelligent use of resources is a joint obligation of rural and urban populations" (page 13).
2. Decentralization of authority. From the earliest times, the doctrine of sovereignty has permeated the thinking and corrupted the actions of mankind. It supposes that the springs of human welfare flow from the top, failing to recognize that their source is in the earth. Administration, to be effective, must rest authority in the people who are to be served.
3. Research. "It is no secret of nature that though soil mineral demands may be small (thank nature for this), plants refuse to capture the abundant and inexhaustible elements from the air and water shelves if adequate amounts of any of this list are not present. This refusal of nature to have her plants grow if the soil minerals are absent is abundant reason why states and nations have chemists and other well trained experts to seek through exhaustive experiments in laboratory, field, and farm the great variety of soil types, etc., and the extent of the natural supplies or deficiencies of these potent soil minerals. They also delve into what elements plants remove and are taken away by plant and animal crops which are sent to cities or are exported. When your land 'goes down' it is not

because of a shortage of air elements, or water shelf elements, unless we have wilfully refused to embrace the knowledge of conserving water, but because of the mineral losses from crops and animals shipped away, or from erosion caused by the energy of falling water which we have not harnessed or otherwise controlled. This partnership of man with nature under these circumstances becomes a necessity" (pages 9-10).

"We owe the men and women who have ventured into the realms of nature a continuous debt of gratitude. Their reward was the discovery of truth that other fellow beings might enjoy the exercise of intelligence and avoid the blind alleys of ignorance" (page 13).

"Freedom under which the divine, diverse provisions of nature may be fully discovered and understood by the diverse abilities of man is what we are fighting to preserve. Fascism prevents, democracy promotes the exercise of this freedom" (pages 2-3).

Workers in agricultural research have a special responsibility to help people to understand the need for "the new emphasis on the land", Dr. Morgan pointed out.

4. Conservation of sources of energy. "There will come a time, if it has not already arrived, when the demand of industry and that for adequate food supply will keenly compete for the energy of the plants grown upon the land. It is here that the joint genius and thought of both rural and urban populations will be centered not only on harnessing the wastes of falling water, but especially upon the long neglected energy of soil fertility--soil that muddies our streams and increases the problems of flood control" (page 7).

"I am sure you realize why all the populations of the world are concerned about conservation and economic use of soil minerals as compared with those of carbon, nitrogen, and oxygen on the air shelf, or even with hydrogen on the water shelf, since we have made important moves to control and conserve water" (page 12).

Neither industry nor agriculture, Dr. Morgan explained, fully realizes the significance of soil fertility as a source of energy.

You will hear some folks urge, for example, that the Tennessee Valley should become the industrial equivalent of the Ruhr Valley. They visualize such a type of industrialization as representing the most effective means of developing and utilizing the sources of energy available to us in the Valley.

You will be astounded, perhaps, to learn how far the actual facts depart from this conception. For example:

The total power generated by the TVA system during the year 1943 amounted to a little over 9 billion kilowatt hours. That is truly an enormous production of power. How many of us realize that the annual production of power from the soils of the Tennessee Valley amounts to many times this figure? To illustrate:

A bushel of (shelled) corn contains 90,720 Calories. At 50 bushels of corn to the acre, this would represent a production of 4,536,000 Calories per acre. On the 26 million acres of land in the Tennessee Valley, this would amount to the staggering total of 118,000 billion Calories, or 137 billion kilowatt hours. That is, the power potential of the soils of the Tennessee Valley, expressed in terms of corn, is 137 billion kilowatt hours in contrast to 9 billion kilowatt hours generated by the TVA system in 1943. That is more than fifteen times the output of power generated by the TVA system in 1943.

Other illustrations:

Since the energy yielded by one acre of corn is approximately 5,000 kilowatt hours, the production of energy, in terms of corn (or any equivalent crop), amounting to the 9 billion kilowatt hours generated by the TVA power plants in 1943 would require only 1,800,000 acres. The balance of the 26 million acres in the Valley (more than 24 million acres) would remain available as a source of added energy from the soil. Dr. Maynard of Cornell University and the U. S. Department of Agriculture has estimated that the daily requirements of the human and domestic animal population of the United States is equivalent to the energy of six billion kilowatt hours, or of 800,000 tons of coal a day (page 7). That is to say, in one day the draft on energy from the soils of the United States is equal to two-thirds of the total power generated by the TVA system in the entire year of 1943.

Dr. Morgan gave as a further illustration of the tremendous capacity of the soil as a source of energy a recent estimate that the total annual growth of timber in trees 6 inches in diameter, and over, in the Tennessee Valley is the equivalent of 37.4 billion kilowatt hours.

These figures dramatically bring home to us the fundamental fact that our primary sources of energy are in the air, water, and soils, which are the common heritages of mankind. No one can understand the real meaning of TVA, Dr. Morgan emphasized, who fails to appreciate the tremendous import of this fact:

Here, for the first time, we have a region-wide program in which the energy of falling water is harnessed and utilized, not simply to power machines, but, above all, to conserve and enhance the productive capacity of our basic source of energy--the soil.

That, said Dr. Morgan, is the meaning of integration. It is the meaning of TVA.

It is this central need--the need for expanding and perfecting this integrated air-water-soil relationship--for the conservation of exhaustible sources of power on which the very life of mankind depends, that Dr. Morgan stressed in his luncheon discussion. With equal emphasis he urged that this can be achieved only through the integrated utilization of nature's inexhaustible supplies of air, water, and land. This fact, he concluded, places on all, and particularly on agricultural leaders in the Tennessee Valley, a special responsibility and duty. That is the responsibility and duty of promoting public knowledge and understanding of the vital need for this "new emphasis on the land".

Sincerely yours,

C. F. Clayton
Executive Secretary

Enclosures 2

APPENDIX I

Farm program, problems, and outlook: Health enough

Summary of remarks made by Dr. J. T. Jardine at the Twenty-First Valley States Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes, page 17)

Subject: Types and Results of Research in Progress and Current Problems of Research on the Relation and Maintenance of Soil Fertility to (A) Human and Animal Nutrition and (B) Food and Feed Production.

To cover this subject even reasonably well would require volumes. Perhaps, however, a few rather direct unamplified statements may come from discussion and thinking along lines which at present appear to bear on our question and to bear especially on research of the future.

(A) As to types and results of research and problems on soil fertility in relation to human and animal nutrition, we might think of:

- (1) Research concerned with so-called minor elements.
- (2) Research relative to individual major fertilizer elements in relationship to quantity and quality of nutritive factors in the resulting foods and feeds.
- (3) The problem of fertilization to maintain a balance as among the fertilizer elements.

(B) As to the question of relation and the maintenance of soil fertility to food and feed production, we might consider this from a viewpoint of yield and adjustment as between crops as the major question, with increase in nutritive quality as a minor question.

Types of research and results that we might think of on this basis would include:

- (1) The fertilizer experiments as to optimum and most economical application of fertilizers for quantity production of food and feeds with reasonable regard for quality.
- (2) Again, the minor elements in relationship to the yield but with regard to toxic quantities of the minor element concerned in the food and feed products--selenium, for example.

With the probability that my time may be up before I finish, I wish here to conclude that:

(1) If we go forward to meet the generalization that no one shall suffer from so-called hidden hunger, we will have many and varied

problems concerned with the so-called minor elements in relationship to soil fertility and human and animal nutrition. To date we have a few findings which appear to be specific and reliable. In general we have hardly started. In general, too, we will move slowly and be dependent upon advancement in basic research for localization, evaluation, and quantity determinations for which we are still waiting upon the use of methods which can be followed by the large numbers of investigators involved in the many phases of the problem.

(2) For effective suppletion of such findings to the specific benefit of human and animal nutrition, we will need to get down to the locality, soil type, and crop. This means that we must do some hard straight thinking as to the extent of solution through fundamental research at one place, as to extent of combined effort for one area, such as TVA, and as to the extent that we must make occasional determinations for two soil types and crops within an individual tract. A day hard thinking because otherwise we may be "wasting our power."

(3) We must watch this matter of balance in fertilization.

Our information is probably too limited at this time to know what complex or number of complexes we may run into.

(4) Under present conditions where volume of major products of reasonably good quality is the dominant concern, however, to reach such higher level of soil fertility through application of increased quantity of fertilizers is a major opportunity to increase food and feed production in the interest of our subject, "Health Enough." Our fertilizer specialists are fairly well prepared to advise the fertilizer elements and amounts for this purpose for the probable short duration of the emergency.

To present and review one set of experiments and their results would fully consume the balance of my time. Since the purpose is to promote informal discussion, I have formulated a few direct statements which, according to my understanding, indicate findings from several experiments bearing upon the foregoing comments. References to my sources of material are given as far as practicable. The more complete statements, published and unpublished, should be reviewed by each individual for the development of his own conclusions and program.

The following are based upon a summary mimeographed progress report on the work of the Regional Research Laboratory for Research into the Relation of Soils to Plant, Animal, and Human Nutrition, at Cornell University, for the fiscal year ended June 30, 1943. Copy of this summary report, along with similar summary reports for each of the other Benbrook-Jones laboratories, was furnished to each Experiment Station Director by letter, under date of October 25, 1943, of the

Assistant Research Administrator. I am sure that your State Experiment Station Director will make his copy available for your review but, of course, not for publication.

(1) Deficient supplies of manganese, zinc, copper, molybdenum, and iron resulted in marked increases in growth and fruitfulness of the tomato, but the content of provitamin A, ascorbic acid, and riboflavin of the fruit was not greatly affected.

(2) Variation in supply of calcium, potassium, magnesium, phosphorus, nitrogen, and sulfur produced no material effect upon ascorbic acid and provitamin A content of tomato fruit.

(3) According to the laboratory, "these results indicate that any fertilization practices employed by the farmer designed to increase crop yields will not limit the nutritive value of the tomato."

(4) The ascorbic acid content of pineapple fruit and turnip greens is not correlated with soil conditions but does vary with climatic conditions, particularly with light intensity.

(5) Three thousand samples of wheat of different varieties grown at various locations throughout the United States showed marked influence of locality upon the relative amount of thiamin (B_1) in the wheat, a spread of as much as 100 percent. A variety rich in thiamin at one location was relatively rich at all locations and, similarly, varieties low were low in all locations.

(6) A study of native pasture and forage in coastal plains of North Carolina and Massachusetts confirm deficiency of cobalt in both areas.

(7) Regarding the importance of proper balance of fertilizer elements, the regional laboratory, for example, reports:

(a) Cobalt deficiency, in North Carolina, is accompanied by a low manganese content of the forages, while in Massachusetts the iron is low.

(b) A trouble called "grass tetany" has been reported to be associated with intensive fertilization with nitrogen, potash, and phosphate. "It seems possible that this intensive fertilization may have accentuated incipient deficiencies of certain other elements in the soil."

(c) Preliminary results indicate that amounts of cobalt, manganese, molybdenum, and other minor elements in both hay and green vegetable crops are affected by liming and

fertilization practices. It seems possible that modification of liming and fertilization practices may result in increased content of some of the essential minor elements in soils.

From the cooperative turnip greens project in this northern region, reported in Journal of Agricultural Research, 68 (1944), No. 4, pp. 145-190, we have the conclusions:

- (1) Conditions associated with place caused 13 to 20 times more variation in calcium and phosphorus content of the greens than did the fertilizer.
- (2) Effects produced from the different treatments varied with the season.
- (3) Soil properties accounted for an important part, but not all, of the variation of the mineral content of greens attributed to place.

Results of fertilizer treatment on calcium, phosphorus, and iron contents of potatoes at the Minnesota Experiment Station as reported in Food Research, 8 (1945), No. 3, pp. 194-201 (abr. in Minn. Farm and Home Mag., Minnesota Sta., 1 (1943) No. 1, pp. 5, 6), indicate that potatoes of four different varieties (Early Ohio, Cobblers, Friend, and Menota) were grown in 16 fields of known soil type with an arrangement in plots within each field to allow the following fertilizer treatments: (1) Phosphate, (2) phosphate-potash, (3) untreated, and (4) nitrogen-phosphate-potash; in addition iron sulfate was applied to one-half of each plot. Calcium, phosphorus, and iron contents were determined in representative samples from each plot, and analyses of variance were computed on the accumulated data to determine the effects of field differences and fertilizer treatments, the relationship between calcium, phosphorus, and iron values, and the effect of paring.

This treatment of the data showed that the diversity in calcium, phosphorus, and iron values was associated with differences inherent in the soil of the various fields rather than with varietal differences or fertilizer treatment. The fertilizer treatments had no significant influence on the mineral values with the exception of phosphorus values from the plots to which phosphate alone had been added. These showed a mean increase in this element of 10.4 percent as compared with the untreated plots. Since potash or iron sulfate, or both, had been added to the other plots, it appeared that these applications suppressed phosphorus utilization. A mean decrease of 4.3 percent in calcium values resulted from iron sulfate treatment. Moreover, potatoes from the sulfate-treated plots contained a significantly smaller amount of iron than those from plots to which no iron sulfate had been applied. There was a highly significant positive correlation between phosphorus and iron values for potatoes from plots treated and not treated with iron sulfates; calcium

and iron and also calcium and phosphorus values were positively correlated for potatoes from the untreated plots, but this relationship did not hold for potatoes from plots treated with iron sulfate.

The New Jersey Agricultural Experiment Station Bulletin 709 (1944), The Boron Needs of New Jersey Soils, reports that 20 important New Jersey soils were found to vary in water-soluble boron content in the surface soil from 18 to 110 parts per million. The boron-fixing power of this same group of soils varied considerably, with the loams fixing as much as ten times as much boron as the sands. These, again, represent but examples of the many findings given in this bulletin, but will illustrate the implications intended to be presented in a discussion of this type. A knowledge of the boron content of soils and the requirements of plants growing on these soils has led to specific recommendations on the concentration of boron that must be present in any one soil type for the successful growth of a particular crop.

The above are merely a few selected examples to illustrate recent research results and problems as a basis for discussion. Experiment stations in this region have facts bearing on this subject. Some of them will confirm the foregoing, but there will be differences, which is one of the problems to be taken into account.

We heard the statements this morning of what can be done with more fertilizer. As far as I have been able to review production goal statements of last fall, one of the opportunities seems to be through fertilizers, and it isn't confined to this region. As far as research, additional research, bears on the point, where shall we go on the demonstration farms? I don't know where the line is drawn between the research responsibility and the extension responsibility. I think we do clearly have the job of getting application where we have apparently much opportunity between what is being done in practice and what is possible. The extent to which participation by research, in order to be sure we have proven facts, that is what you want in your locality, is your responsibility; you people know the extent to which research responsibility should be accepted.

As to the future, looking forward to this relationship of soil fertility, we must keep in mind a lot of things besides the fertilizer we get. Being specialists, we need to be looking ahead to the complexity of factors so as to be sure that when we have a phosphate program or a lime program, we are not overlooking the possible toxicity or possible depressing effects on minor elements that go into good quality.

And, finally, I agree with Dr. Morgan that whatever else we do with the tremendous number of problems before us, we should have a continuing, a vigorous program on this question of soil fertility maintenance in relationship to both the amount and the quality of food and have it combined with a continuing, vigorous program of improvement of our plants and get as much flexibility as we can in the selection to make our rotation combinations to fit in and improve the income on these

20-acre farms. I have glanced over a number of the postwar program documents from this area, and I have written in my own mind, thinking of increased farm income and standard of living in this whole area, the tremendous number of small farms. If you can't change the size, there is some opportunity for improvement through more efficient application of what data we have and by obtaining more data on efficient methods of production including better crops.

APPENDIX J

Current Valley research program

/Summary of remarks made by Director L. D. Baver at the Twenty-First Valley Water Conference, Knoxville, Tennessee, April 5, 1940 (50th Anniversary of Minutes, page 17)

I want to bring out, first, watershed protection as indicated in the French Broad study. Don't know whether you all know about it or not; so I will take a few minutes to tell about it. Over at Asheville, North Carolina, the folks are quite concerned about floods, from the standpoint of industrial losses. They prevailed upon Tennessee Valley engineers to make a study to see what might be done. As a result of that request, engineers have gone over and have outlined a series of dams for flood control for both industrial areas and agricultural lands. At the same time, while they were doing that, we folks who were interested in the soil and plant aspects, like Dr. Morgan talked about this morning, thought that these dams are only one phase of the flood-control problem. We did in that area some hydrologic studies by Dr. Morgan of the Biological Forest Service at Asheville. We knew what the infiltration of water in a given soil was. We didn't exactly know what the infiltration on different soil types under different covers was. Knowing the soils of the area with their profile characteristics, we set out on a program of going across the whole French Broad Valley to get at the land use as far as vegetation was concerned. That was the only way we could know about the soil types. We went on test-demonstration farms to find out what the practices were at that time. We then got the farmers, farm leaders and county agents to tell what they thought might be the speed with which farmers would take up the suggestions and improve the land. On the basis of these studies we arrived at a figure of what it would mean to the whole area in the French Broad River, at these dams particularly, if we had the land under the right type of management to get more efficient water control on the farm. I don't believe in carrying figures in my head, but as a result of that, the engineers took those data and cut down the size of the dams that they had planned for adequate flood control.

We have published these data in a bulletin from the Experiment Station. I was interested when Dr. Black wrote for a number of copies and said it was the most outstanding land-use plan based on fundamentals we had seen yet. We took into consideration two things that really counted: the soil and the vegetation that was going to be grown, and how it was going to be grown. It has pleased us that we got the engineers interested in this approach. It is one of the few times engineers have listened to agronomists. I think it is a place where research has played an important part, and I think we will find that this particular approach can be used to advantage in other areas.

Let us discuss the research program of the products that the Tennessee Valley Authority turns out.

As far as the fertilizer materials are concerned, I have personally been somewhat disappointed. We haven't got the type of integration Dr. Mayer talked about. I have made the statement several times, if any particular area in the United States had a chance of getting integrated research it was the Tennessee Valley. We had meetings until the pressure of war came along. Two years ago in Atlanta the agronomy and animal industry folks got things standardized. As a result of the meeting, Dr. Carrigan, Dr. Volk, and I were appointed as a research committee, and it was our responsibility to get more integration into the experiments. We haven't got as much integration as we should because of the fact, as I visualize it, that we aren't in a position to be an action committee. We are supposed to be an advisory committee. Too much material is coming up to get action on. If the Tennessee Valley had a full-time man on research that could be considered a joint employee of the seven states, who could bird-dog those things that came out, I believe, with a little advice we could get coordination. Those of us on the committee have a lot to do ourselves.

Let us take the question of fused phosphate.

I was over in Knoxville a while back and we had a little session with several Tennessee folks in regard to fused phosphate. They went through a series of experiments with all the states last year. As far as experimental data are concerned, I would say that some of the data is significantly different from the other. We talked a lot about the size of particle we ought to have. We found that it makes a lot of difference in the cost of getting the phosphate cut. It is my understanding of the objectives of TVA that their objective in turning over phosphate is not to give it away to folks, but to find out what is the most economical way of getting it to farmers. This fused phosphate seems to give possibilities because of the cheapness of manufacture. If it were ground to 40-mesh, it would cost 15 cents a unit to do that grinding; whereas if 20-mesh were satisfactory, they don't have to grind but about 10 percent. Consequently, that would cut down the cost of production, and that means an awful lot now from the standpoint of the large tonnages used. It is a type of experiment somewhat unlike a fertility experiment where you can say one type is better than another for production. If, on the basis of wide difference, we can find, for example, that not grinding to 40-mesh but grinding to 20-mesh is just as good, it is going to mean a lot of money saved. The statistical folks at a conference at Raleigh worked out quite a few possibilities. They set up at least a suggestion for all the stations to use the same type of experiment so that when we come back a couple of years later we can tell the TVA that 20-mesh or 40-mesh is the size we should have. Experiments last year showed that 6-mesh was as good as 80-mesh. It would be advantageous if someone were available to go around to the various stations and discuss this type of coordination.

Coming to the nitrogen program:

I am one of those folks that think we are letting our enthusiasm get the best of our better judgment. Just because we have war plants making nitrogen is not a sign that we are going to have cheap nitrogen. We haven't developed any process that is going to lower the cost. This is one place where I am not sure that I am in sympathy with the Tennessee Valley folks' program of nitrogen. I haven't been able to reconcile myself to whether we, on a state level, should go into an exhaustive type of experimentation on liquid ammonia when we are not sure that liquid ammonia is the type of nitrogen we want. I am of the opinion that if we are ever going to get our farmers to use liquid nitrogen, we are going to have to give them something not so difficult to handle. Considerable research should be done to answer the question of the kind of ammonia we are going to use. Some good preliminary data would have helped a lot. I have a report from G. L. Terman of the Kentucky Station on "Application of Ammonium Hydroxide to Soils as a Source of Nitrogen" which is an excellent report. He brings out the questions of the loss of ammonia. We had a liquid nitrogen meeting over at Wilson Dam last fall in which a lot of these things were discussed, and at that particular time we made a lot of progress. We had the group divided into those interested in putting liquid nitrogen on the land and those interested in the effect of liquid nitrogen on the plant.

Dr. Smart of the University of Tennessee has developed a pump for putting liquid nitrogen on the land. We at Raleigh have one of those pumps and we are also developing a constant head gravity feed which does not require a pump. We are experimenting with this type of liquid nitrogen. We use a solution of ammonium nitrate and urea. We also used this liquid ammonia. We have been able to use urea with excellent results but liquid ammonia burns green things up. This particular research is concerned with the method of application. Then there is the question of how we are going to get the stuff out to the farmers now. I think that is a little previous. And, again, I would like to raise this question: how are we going to put liquid ammonia on the test-demonstration farms? Frankly, I don't think test-demonstration farms are the first place to put on ammonia.

There has been a lot of experimentation on how to get it on. It can be put on with a road machine. Reeves of Alabama had some kind of barrel put on a disk with a lot of tubes running down to the ground. There are a lot of other ways. An interesting thing from the standpoint of our experience is that we find if it is applied in the right type of solution it is not volatile. We have a committee on the agronomic phases of liquid nitrogen headed by Dr. Jones of Auburn, Dr. Alexander of Georgia, and Dr. Andrews of Mississippi. We are trying to get the work coordinated. I am just a little bit disappointed, when we think in terms of the nitrogen problem, that we didn't get it coordinated in

the beginning. I see no reason why we here as a group of people in the South, interested in the same problem, cannot coordinate our work to make the products of an organization and adapt them to agriculture. Why can't we get together?

We need at least three institutions in an area that are willing to go together on the same type of feeding experiments on fused phosphate because maybe fused phosphate may be good as an animal feed; maybe the cost of grinding can be distributed if some of it can go for feeds. I don't believe that every state has to do everything. I believe we should divide the work somewhat. If Mississippi and Virginia and Kentucky come out with fundamentals in one phase, and Georgia, Alabama, and Tennessee in another phase of it, we are willing to accept the results. There is a loss of time when every state is making the same experiments. I think our committee has done a lot of good getting our thinking centered in that direction. My suggestion is that we ought to have a strong research committee to get at some of these problems, the answers of which we do not know, that someone should devote his full energy to the program, a man that will handle all the details.

APPENDIX 2

Twenty-First Valley Research Program: Possible methods of improving the test-demonstration farm program and achieving more effective utilization of its results

/Data presented by Mr. Clyde Yeck at the Twenty-First Valley States Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes, page 11)7

In County Extension work in a county here in East Tennessee, we have been concerned from the beginning with the problem of establishing and developing farm unit test-demonstrations representative of the most numerous and important kinds of farms in the county. As Mr. McLeod told you, we have recently, with the help of the soils people, made some new groupings of farms in Jefferson County on the basis of soils, size, and type of farming carried on. In that connection the first thing we would like to show you is a soil map of our county on which the soils people have outlined major soil association areas. In each area there tends to be a characteristic combination of soils which is different from the combination of soils in each of the other areas. For example, in this area Fullerton soils, and soils commonly found in association with Fullerton soils, predominate. Medium-sized and small farms are found to be the rule throughout this area. Here in another area, the heavy and medium soils predominate. These soils are, or can be made very fertile. Large livestock and dairy farms are the rule here. Here, in a third area, heavy shale lands of the Dandridge series predominate. Erosion has been more destructive here than in the two areas I have singled out just previously, because corn has been grown on more steep land, and it has been increasingly difficult to establish good sods after corn has been grown. This section was known thirty years ago, as the red clover section of Jefferson County. Now there is less red clover there than in most other parts of the county, primarily because erosion damage has made it so much more difficult to grow red clover.

These three areas illustrate the differences in farm conditions in one part of the county as compared with another. A soil association map is necessary, or almost necessary, to the development of a working knowledge of the nature and extent of these differences. We feel that a working knowledge of these differences is essential to the development of an effective test-demonstration program in the county.

We have outlined in red pencil the boundaries of the present test-demonstration farms. From them you may judge how well or how poorly they are situated with respect to geology, geography, and soils. We hope you will remember that, in the beginning, we did not have this much information to guide us in establishing test-demonstrations. We

thought at first that if we had test-demonstration farms within standing distance of other farms in a given community, we were doing about as well as we could.

When our county soils survey became available we began to take kinds of soils into account in the establishment of test-demonstration farms. We began to gather records of experience and accomplishments on test-demonstration farms and to show and tell other farmers these experiences. The more of this we did the more we began to realize that other factors than soils influenced the applicability of test-demonstration experience. For example, we couldn't always talk convincingly to a farmer with 50 acres about the experience of a man who had a large beef cattle farm. That experience just didn't apply to his conditions. He would tell us, and we have become convinced, as we have studied farm records, that some of it really doesn't apply.

This conviction has led us to make several attempts to classify the farms in the county and set up test-demonstrations representing groups of farms not previously well represented. However, we have never been satisfied with the best we could do in this respect.

With the help of soils men and farm management men we have made an attempt recently to arrive at a grouping of the farms within each of the soil association areas shown on this map so that we can tell if we have a test-demonstration farm, already established, that represents a given group well enough that experiences on the test-demonstration farm are applicable to all the farms in that group. We hope, also, by this procedure, to be able to arrive at specifications for a farm representative of any important groups not well represented. To accomplish these objectives, we are sure that the kinds of soils, the size of the farm, and the kind of farming must all be taken into account in making the groupings.

Ertcheson: Did you give any consideration to the density of population?

York: That is an important thing. We realize that classification of farm isn't enough--that even when we have a well-developed test-demonstration farm well representative of a group of farms, its educational value isn't at its maximum unless all the farmers to which its experience is applicable have opportunity to visit it and observe this experience first hand. No one test-demonstration farm can be so located with reference to a group of several hundred farmers, many of whom do not have autos, scattered over twenty miles of territory. This is the case of some groups in some of the more important areas of the county. Here, on the map, is an area where many--perhaps most--farmers do not have autos. If they are to see and fully benefit by the experience of test-demonstration farmers, we may need to have test-demonstrations thicker

then in this other area where nearly all farmers have cars and visit a great deal more.

Hutcheson: How many demonstration farms are there in the county?

York: Fifty-three are active at the present time.

This method of classification of farms involves first the selection of one or more sample areas within each soil association area. Second, it involves outlining the boundaries of all the farms in the sample area and identifying each. We were able to do this from records and farm boundaries on aerial photographs in the county soil office. Third, from soil farm plans we were able to get information as to the acres of each crop grown and the numbers of each kind of livestock kept. From this we could make classifications of the farms as to type of farming carried on.

One of the most numerous groups of farms in the large Fullerton area of the county is of farms about fifty acres in size or rolling to Billy Fullerton soils on which little other than a small patch (usually an acre or less) of tobacco is grown for sale. These farms, however, customarily raise the major part of the food consumed by the farm family--grains, potatoes, milk, poultry and eggs, pork, vegetables and fruits. There are about 200 farms in this group in this area. Less numerous in this same area are about 100 farms of 75 to 100 acres on the same kind of land. However, we have three test-demonstration farms from among the 75- to 100-acre group and only two from among the 50-acre group. Furthermore, those from among the 75- to 100-acre group have made greater progress than the 50-acre ones.

The farm of Charles L. Gammon is one of the two test-demonstrations representing the 200 farms of about 50 acres in size. As a test-demonstration it is the better of the two, in that more improvement of the farm and farming system has taken place.

Mr. Gammon has reduced the rate of soil erosion on his farm very materially and has substantially increased his yields of crops through the use of lime and phosphate on lespedeza. He has increased his acreage of pasture and his production of both hay and pasture very materially. He sold last year nearly four times as much milk and 50 percent more tobacco than in the average of the two years before he became a test-demonstrator. The total quantity of products grown for home use has increased a fourth and the total quantity of products sold have been increased by two-thirds. These increases have been made with no increases in farm labor or equipment.

We feel, however, that he has not developed his farm and farming system as nearly up to the point made possible by liming and mineral fertilization as some of the larger farms on the same kind of land have done. For example, he has not grown any alfalfa or red clover. More than three-fourths of all of our unit test-demonstration farmers have learned to grow one or both of these crops and made them a regular part of their

farming systems because they add to the quality and quantity of food produced and improve land faster than lespedeza.

Some of the more successful upland tomato crops in the county have been grown on Fullerton soils. The canneries are in desperate need of tomatoes, and Gammon has the family labor to grow them. Yet, as in the case of many other suggestions to him and farmers like him, he has not seen fit to take the risk involved. His story is that there is too much chance for failure with tomatoes. Thus, we can cite no experience with either red clover, alfalfa, or tomatoes on very small test-demonstration farms on Fullerton soils. Yet we do know that larger and more progressive farms on this soil--the most prevalent in the county--are producing all three of these crops successfully.

With all of the difficulties we face in working with farmers of this group, and similar groups in other parts of the county, we feel that we cannot ignore them in the conduct of the test-demonstration work. They make up too large a part of our farm population and they own too much of the land in our county to be left out.

We think we can point out to the leadership and the community groups of this area the nature and importance of this people more effectively with this material than we have been able to do without it. We have hopes that with their help we will be able to establish and develop more and better test-demonstrations on representative small and very small farms. With larger numbers, we hope some will be willing to take chances more than Mr. Gammon has and will be able to develop further as test-demonstrations.

We have hopes some new research work is going to give us better ammunition with which to approach these people and that it will take some of the risks out of tomatoes and other promising things Mr. Gammon and other farmers like him are at present reluctant to try.

Maybe we haven't devoted enough effort to leading him in strengthening his home food supply program. Certainly this is of first importance to him and his family. Maybe we haven't placed it first in our dealings with him as a test-demonstrator.

At any rate, we are keenly conscious that we need more help in soliciting and developing test-demonstrations of this kind as well as some of the other kinds we may discover not to be well represented at present.

APPENDIX L

Classification of Farms in Relation to the Use of the Soil Survey and Similar Data and of the Results of the Test-Demonstration Farms

Remarks of Dr. Charles E. Kellogg at the Twenty-First Valley States Conference, Knoxville, Tennessee, April 3, 1944 (See text of Minutes, page 12)

Detailed soil survey. Because of the great variations in soil conditions that markedly influence crop adaptability, soil productivity, management, requirements and responses, and soil use, the modern soil survey must be sufficiently detailed to indicate the relevant conditions on individual fields. The results of experience of farmers and of research work need to be assembled and interpreted on the basis of these local soil conditions so that definite recommendations, applicable to specific fields, can be developed. A good many different soil types and phases must be established, and the boundaries and areas of these must be drawn in great detail. All this means, necessarily, a relatively complicated soil map when viewed from the standpoint of a large area, such as a county.

The soil association. Certain local soil types and phases are commonly found associated together. Maps can be prepared that show the areas of soil associations in which the individual soil types are repeated over and over, according to a more or less characteristic pattern. Although farms located in any particular soil association may include several soil types, these are repeated, all or in part, on all the farms in the soil association. Thus the results obtained from the whole farm can be usefully related to the soil association, in somewhat the same way that results from individual fields are assembled according to the individual soil types and phases within the soil association. Such a grouping of soil types into soil associations makes it possible to organize the vast amount of detailed data into manageable groups for purposes of handling the results from the test-demonstration farms, and for programming the activity, both as to selection of farms and as to extending the results to other farms.

Grouping of farms. Since the applicability of the results on any one test-demonstration farm depends upon the similarity of that farm to other farms, there is need for some sort of farm classification. On the physical side, it would seem that the soil association, the type of farming, the size of farm, and the relative proportion of classes of soils on the farm, made up of soil types grouped according to productivity and management requirements, would be the important criteria. With farms classified according to these four characteristics, we should have, as a result, individually defined groups of farms, with each group relatively homogeneous as to the physical and biological factors influencing production. It should seem desirable to have enough test-demonstration farms in each such group to have a fair sample of the group. Results from

these test-demonstration farms could then be made available readily to all other farmers having farms of the same group.

Analysis of Differences in success between test-demonstration farms and other farms of the same group. By comparing the farms within a given group, defined primarily according to the factors that influence production, the influence of economic, social, and human factors may be more adequately determined. Such influences would include tenure, age of operator, credit, knowledge and skill of operator, etc. Through a comparison of the results obtained on the test-demonstration farms, and by successful operators, with those obtained by less successful operators, attention can be directed to the limiting factors. The comparisons would make possible an orderly alignment of educational and research programs for the purpose of reducing or eliminating these limiting factors. County agents, for example, would have a useful tool for giving appropriate and relevant emphasis to their various activities, as related to the need on different types of farms and in different areas within their counties.

Regional significance of farm classification. Since soil conditions and types of farming do not coincide with State or county lines, there will be a distinct advantage in having such an activity correlated on a Valley-wide basis and, ultimately, on an even wider basis. Many results obtained in particular States and counties have equal relevance in adjoining States and counties. If assembled with sufficient order so that everyone understands the nature of the results and where they may be applied, they can be widely used. In developing such a plan of organizing data full cognizance may be taken of all the significant local factors, and at the same time, have the results expressed in terms generally understood and generally useful.

The size of the job. Although the total amount of work required to develop the classification of farms in these terms is very large, it must be recalled that a great deal of the necessary information already exists. Detailed soil maps and maps of soil associations are available for a good many counties, and additional ones are being developed. A large amount of data exist regarding test-demonstration farms; much is known about the type of farming. Of even greater importance, is the fact that a large number of skilled men are already engaged in these activities in the Valley. The suggestion made then is not one of beginning a new program, but rather one of organizing the results of a going program in order to make them more effective, and to increase the efficiency of the individual workers. It is unnecessary that the job be done all at once, which, indeed, would be impossible, and probably undesirable. If the work already under way were directed toward this end much could be accomplished, especially if the results had the expected effect of increasing the efficiency of the work of those concerned with the test-demonstration program. In this connection, work involved should be considered in relationship to the results of the test-demonstration program, rather than to number of farms or area in square miles.

The Division of Soil Survey will be glad to assist in such a program, especially because it would seem to offer excellent possibilities for a wider and more timely use of the large amount of data obtained in the course of a soil survey at considerable public expense.

